

Remarks

In view of the above amendments and the following remarks, reconsideration and further examination are requested.

Claims 12, 13 and 21-24 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Khandros (US 5,917,707).

Claim 12 has been amended so as to further distinguish the present invention over the reference relied upon by the Examiner. Further, new claims 25-35 have been added. Claims 12, 13 and 21-35 are patentable over Khandros for the following reasons.

Claim 12 is patentable over Khandros, since claim 12 recites a semiconductor arrangement comprising, in part, a bump electrode having a first protrusion and a second protrusion bonded to an IC electrode on a circuit forming surface of a semiconductor element, wherein said bump electrode is approximately V-shaped, and a bottom portion of the 'V' faces towards the semiconductor element. Khandros fails to disclose or suggest a bump electrode as recited in claim 12.

Khandros discloses a flexible contact structure that can be used to connect electric components. In one embodiment, a flexible contact structure 136 is made up of a flexible elongated conductive element 137 having two bends 137a and 137b formed therein and a ball bond 138 at a first end and a ball bond 139 at a second end. In another embodiment, a semiconductor package assembly 401 is a printed circuit board 411 which carries circuitry including contact pads 412 on a first side and contact pads 413 on a second side. Semiconductor devices 416 and 417 are provided on opposite sides of the printed circuit board 411 and carry resilient structures 418. The resilient structures 418 are bonded to the contact pads 412 and 413 and an encapsulant 419 is formed around the resilient structures 418. (See column 7, lines 17-44 and Figure 3 and column 16, line 60 - column 17, line14 and Figure 25).

Based on the above description and the illustrations of Figures 3 and 25, it is apparent that while the elongated conductive element 137 and the resilient structures 418 have a number of bends therein, neither the elongated conductive element 137 or the resilient structures 418 are approximately V-shaped with a bottom portion of the 'V' facing towards an electric component 102 and the printed circuit board 411, respectively. Instead, the bends in the elongated

conductive element 137 and the resilient structures 418 face substantially along a plane parallel to surfaces to which they are mounted. As a result, Khandros fails to disclose or suggest the present invention as recited in claim 12.

Claim 25 is patentable over Khandros, since claim 25 recites a semiconductor arrangement comprising, in apart, a bump electrode having a first protrusion and a second protrusion bonded to an IC electrode on a circuit forming surface of a semiconductor element, wherein the first and second protrusions have substantially a same height and are either both in contact with or substantially equally close to an electrode on a circuit board when the semiconductor element is mounted on the circuit board. Khandros fails to disclose or suggest a bump electrode having a first protrusion and a second protrusion as recited in claim 25.

As discussed above, Khandros discloses the elongated conductive element 137 and the resilient structures 418 having a number of bends therein. The rejection indicates that the free ends and the bends of the elongated conductive element 137 and the resilient structures 418 correspond to the protrusions as recited in claim 25. (See column 7, lines 17-44 and Figure 3 and column 16, line 60 - column 17, line 14 and Figure 25). However, it is apparent from Figures 3 and 25 that no pair of a free end and a bend or pair of bends in the elongated conductive element 137 or the resilient structures 418 are either both of a same height or both in contact with or substantially equally close to an electrode on a circuit board when the semiconductor element is mounted on the circuit board. Instead, the ends and bends are all at different levels along the lengths of the elongated conductive element 137 and the resilient structures 418.

Further, in another embodiment of Khandros, a semiconductor package 461 has a printed circuit board 462 having vertical via conductors or plated through-holes 463 extending therethrough. A semiconductor device 466 is provided with resilient contact structures 467 that have a plurality of bends 467a and 467b. The semiconductor device 466 can be mounted to the printed circuit board 462 by placing the resilient contact structures 467 into the through-holes 463 such that the resilient contact structures 467 contact the surface of each of the through-holes 463 twice to hold the semiconductor device 466 in place. (See column 18, lines 21-41 and Figure 28). However, while Khandros discloses that each of the resilient contact structures 467 contact the surface of the through-holes 463 twice, it is apparent that the portions of the resilient

contact structures 467 do not have substantially a same height, since the through-holes 463 are contacted at two different levels. As a result, Khandros fails to disclose or suggest the present invention as recited in claim 25.

Claim 30 is patentable over Khandros, since claim 30 recites a semiconductor arrangement comprising, in part, a bump electrode having a first protrusion and a second protrusion bonded to an IC electrode on a circuit forming surface of a semiconductor element, wherein the first and second protrusions are in contact with or close to an electrode on a circuit board when the semiconductor element is mounted on the circuit board, and wherein the vertex portion of the first protrusion has a flat surface portion parallel to the IC electrode and a vertex portion of the second protrusion has a flat surface portion parallel to the IC electrode. Khandros fails to disclose or suggest a bump electrode having a first protrusion and a second protrusion as recited in claim 30.

As discussed above, Khandros discloses the elongated conductive element 137 and the resilient structures 418 having a number of bends therein. The rejection indicates that the free ends and the bends of each of the elongated conductive element 137 and the resilient structures 418 correspond to protrusions as recited in claim 25. (See column 7, lines 17-44 and Figure 3 and column 16, line 60 - column 17, line 14 and Figure 25). However, it is apparent from Figures 3 and 25 that no pair of a free end and a bend or pair of bends in the elongated conductive element 137 or the resilient structures 418 have flat surface portions parallel to either a surface of an electronic component 102 or the printed circuit board 411, respectively. As a result, Khandros fails to disclose or suggest the present invention as recited in claim 30.

Further, it is apparent that the other embodiment of Khandros that discloses the resilient contact structures 467 having the plurality of bends 467a and 467b fails to disclose that the portions of the resilient contact structures 467 that are in contact with the through-holes 463 have flat surface portions parallel to the semiconductor device 466. As a result, Khandros fails to disclose or suggest the present invention as recited in claim 30.

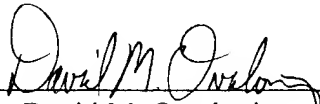
Because of the above mentioned distinctions, it is believed clear that claims 12, 13 and 21-35 are patentable over Khandros. Furthermore, it is submitted that the distinctions are such that a person having ordinary skill in the art at the time of invention would not have been

motivated to modify Khandros or make any combination of the references of record in such a manner as to result in, or otherwise render obvious, the present invention as recited in claims 12, 13 and 21-35. Therefore, it is submitted that claims 12, 13 and 21-35 are clearly allowable over the prior art of record.

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance. The Examiner is invited to contact the undersigned by telephone if it is felt that there are issues remaining which must be resolved before allowance of the application.

Respectfully submitted,

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